

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-187293

(43)Date of publication of application : 02.07.2002

(51)Int.Cl. B41J 2/175  
 B41J 2/18  
 B41J 2/185  
 B41J 2/165

(21)Application number : 2000-389224

(71)Applicant : SEIKO EPSON CORP

(22)Date of filing : 21.12.2000

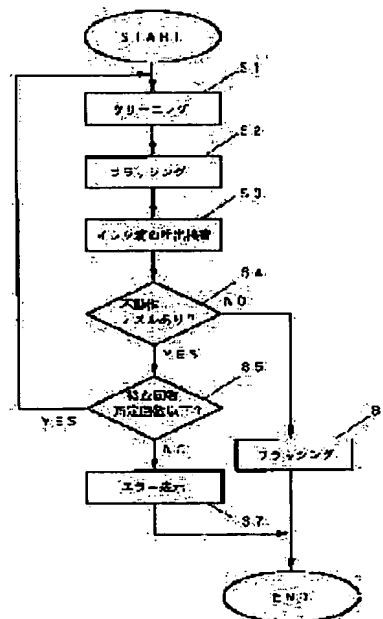
(72)Inventor : MATSUMOTO HITOSHI

## (54) INKJET RECORDING DEVICE AND METHOD FOR INSPECTING JETTING OF INK DROP

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide an inkjet recording device and a method for inspecting jetting of ink drop that inspects the jetting of the ink drop more surely after cleaning movement.

SOLUTION: A jetting of ink is done by supplying a flushing driving signal to a recording head after finishing the movement of cleaning means, and after that, an inspection part inspects whether the ink drop is jetted from a nozzle or not. Even if unstable nozzles caused by cleaning are produced, the state remains unchanged after inspecting the jetting of the ink drop because it shifts to a defective state (a motionless state) without jetting the ink perfectly in the middle of flushing, or it shifts to a good state where the ink is jetted well. As a result, inspecting the jetting of the ink drop can help to inspect surely whether the ink drop is jetted or not and promote the smooth movement of printing.



## LEGAL STATUS

[Date of request for examination] 23.06.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3514235

[Date of registration] 23.01.2004

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

BEST AVAILABLE COPY

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**CLAIMS**

---

[Claim(s)]

[Claim 1] The ink jet type recording head which it is loaded with on the carriage which moves crosswise [ of a record form ], breathes out an ink droplet from a nozzle, and forms an image in a record medium, With the head actuator which said recording head is driven [ actuator ] and makes an ink droplet breathe out, and the horizontal-scanning actuator which drives said recording head along a main scanning direction, and performs horizontal scanning With the Banking Inspection Department which detects the existence of the regurgitation of the ink droplet from the nozzle of said recording head A cleaning means to apply negative pressure to the nozzle of said recording head, to make discharge ink, and to wipe away a nozzle forming face by the wiping member, It has a control section for controlling said each part. Said control section The ink jet type recording device characterized by performing the regurgitation of ink by supplying the Flushing driving signal to a recording head before inspecting the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department after termination of a cleaning means of operation.

[Claim 2] As a result of inspecting the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department, when a non-actuation nozzle is accepted, said control section Apply negative pressure to the nozzle of said recording head, and ink is made to discharge with a cleaning means. The ink jet type recording device indicated by claim 1 characterized by performing the regurgitation of ink by supplying the Flushing driving signal to a recording head, and performing regurgitation existence inspection of the ink droplet by the Banking Inspection Department after that after wiping away a nozzle forming face by the wiping member.

[Claim 3] Said control section is the ink jet type recording device indicated by claim 1 or claim 2 characterized by performing the regurgitation of ink by supplying the Flushing driving signal to a recording head after inspection termination of the existence of the

expulsion of an ink droplet from the nozzle by the Banking Inspection Department.

[Claim 4] The ink jet type recording device indicated by claim 2 or claim 3 characterized by making an error message when inspection of the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department is made the number of predetermined times.

[Claim 5] The ink jet type recording head which it is loaded with on the carriage which moves crosswise [ of a record form ], breathes out an ink droplet from a nozzle, and forms an image in a record medium, With the head actuator which said recording head is driven [ actuator ] and makes an ink droplet breathe out, and the horizontal-scanning actuator which drives said recording head along a main scanning direction, and performs horizontal scanning With the Banking Inspection Department which detects the existence of the regurgitation of an ink droplet from the nozzle of said recording head A cleaning means to apply negative pressure to the nozzle of said recording head, to make discharge ink, and to wipe away a nozzle forming face by the wiping member, In the regurgitation inspection approach of the ink droplet of the ink jet type recording device equipped with the control section for controlling said each part The regurgitation inspection approach of the ink droplet of the ink jet type recording device characterized by performing the regurgitation of ink and inspecting the existence of the expulsion of an ink droplet from a nozzle by the Banking Inspection Department after that by supplying the Flushing driving signal to a recording head after termination of a cleaning means of operation.

[Claim 6] As a result of detecting the existence of the expulsion of an ink droplet from the nozzle by said Banking Inspection Department, when a non-actuation nozzle is accepted Apply negative pressure to the nozzle of said recording head, and ink is made to discharge with a cleaning means. Wipe away a nozzle forming face by the wiping member, and the regurgitation of ink is performed by supplying the Flushing driving signal to a recording head. The regurgitation inspection approach of the ink droplet of the ink jet type recording device indicated by claim 5 characterized by inspecting the existence of the regurgitation of the ink droplet from the nozzle by the Banking Inspection Department after that.

[Claim 7] The regurgitation inspection approach of the ink droplet of the ink jet type recording device indicated by claim 5 or claim 6 characterized by performing the regurgitation of ink by supplying the Flushing driving signal to a recording head after inspection termination of the existence of the expulsion of an ink droplet from the nozzle of the recording head by said Banking Inspection Department.

[Claim 8] The regurgitation inspection approach of the ink droplet of the ink jet type

recording device indicated by claim 6 or claim 7 characterized by making an error message when the count of inspection of the existence of the expulsion of an ink droplet from the nozzle of the recording head by said Banking Inspection Department is judged to count and count[ of predetermined ]-do.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION**

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink jet type recording device which can detect a non-actuation condition certainly, and the regurgitation inspection approach of an ink droplet in regurgitation inspection of an ink droplet about an ink jet type recording device and the regurgitation inspection approach of an ink droplet in detail.

[0002]

[Description of the Prior Art] An ink jet type recording device has the comparatively small noise at the time of printing, and since it can form a dot small moreover by the high consistency, it is used for many printings which include color printing in these days. Record is performed by making a record form breathe out an ink droplet, such an ink jet type recording apparatus being equipped with the ink jet type recording head which receives supply of the ink from an ink cartridge, and the paper feed means to which a record form is relatively moved to a recording head, and moving a recording head based on print data. And black, yellow, cyanogen, and the recording head in which the regurgitation of the ink of a Magenta is possible are carried on carriage, and full color printing is enabled by changing the regurgitation rate of not only the text print in black ink but each ink.

[0003] On the relation which prints by making a record form breathe out from a nozzle the ink pressurized at the pressure generating room as an ink droplet, blinding is further generated for a nozzle by mixing of air bubbles etc., and the above mentioned ink jet type recording head has lifting of the ink viscosity resulting from evaporation of the solvent from a nozzle, solidification of ink, adhesion of dust, and the problem cause poor printing.

[0004] In order to solve this problem, the capping means is formed in ink jet type record.

When blinding arises for a nozzle, this capping means not only functions as a lid which prevents desiccation of the ink of the nozzle in a recording head, but is equipped with the regurgitation capacity recovery function of the ink which closes a nozzle forming face with a capping means, attracts ink from a nozzle with the negative pressure from a suction pump, and cancels the blinding of a nozzle.

[0005] And attraction blowdown processing of the compulsory ink of a blinding dissolution of a recording head performed for accumulating The case where it is called cleaning treatment and printing is resumed after the pause of the long duration of equipment, When the user has recognized poor printing, for example, ON actuation of the cleaning command switch is carried out The wiping member which consisted of elastic raw materials, such as rubber, after applying the negative pressure by the suction pump and making ink discharge in a capping means from a recording head is accompanied by the actuation which wipes away a nozzle forming face.

[0006] In addition, if it is in an ink jet type recording device, the so-called Flushing which cancels the blinding of a nozzle is also made by carrying out the regurgitation of the ink from the nozzle of a recording head to a capping means for every fixed time amount.

[0007]

[Problem(s) to be Solved by the Invention] By the way, after cleaning treatment is made, in order to detect a non-actuation nozzle, regurgitation inspection of an ink droplet is conducted. In this inspection, although that cause was not certain in the nozzle immediately after making cleaning treatment, there is a nozzle with unstable actuation rarely and this defect nozzle was not able to be detected certainly. That is, at the time of regurgitation inspection of an ink droplet, since ink was breathed out from a nozzle with instability, the technical problem that could not detect this nozzle as a defect nozzle, discharging stabilized in subsequent printing actuation was not obtained, and good printing was not obtained occurred.

[0008] This invention aims at offering the ink jet type recording device which is made in order to solve the above-mentioned technical technical problem, and can make more certainly regurgitation inspection of an ink droplet conducted after cleaning actuation, and the regurgitation inspection approach of an ink droplet.

[0009]

[Means for Solving the Problem] The ink jet type recording device concerning this invention accomplished in order to attain the above mentioned object The ink jet type recording head which it is loaded with on the carriage which moves crosswise [ of a record form ], breathes out an ink droplet from a nozzle, and forms an image in a record

medium, With the head actuator which said recording head is driven [ actuator ] and makes an ink droplet breathe out, and the horizontal-scanning actuator which drives said recording head along a main scanning direction, and performs horizontal scanning With the Banking Inspection Department which detects the existence of the regurgitation of the ink droplet from the nozzle of said recording head A cleaning means to apply negative pressure to the nozzle of said recording head, to make discharge ink, and to wipe away a nozzle forming face by the wiping member, It has a control section for controlling said each part, and after termination of a cleaning means of operation, before said control section inspects the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department, it is taken as the performing-regurgitation of ink description by supplying the Flushing driving signal to a recording head.

[0010] As a result of inspecting the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department, when a non-actuation nozzle is accepted, said control section here Apply negative pressure to the nozzle of said recording head, and ink is made to discharge with a cleaning means. After wiping away a nozzle forming face by the wiping member, it is desirable by supplying the Flushing driving signal to a recording head to perform the regurgitation of ink and to perform regurgitation existence inspection of the ink droplet by the Banking Inspection Department after that.

[0011] Moreover, as for said control section, it is desirable after inspection termination of the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department to perform the regurgitation of ink by supplying the Flushing driving signal to a recording head. Furthermore, when inspection of the existence of the expulsion of an ink droplet from the nozzle by the Banking Inspection Department is made the number of predetermined times, it is desirable to make an error message. This error message is made by the display means by the side of a recording device, or the display means by the side of a host computer.

[0012] The regurgitation inspection approach of the ink droplet of the ink jet type recording device concerning this invention accomplished in order to attain the above mentioned object The ink jet type recording head which it is loaded with on the carriage which moves crosswise [ of a record form ], breathes out an ink droplet from a nozzle, and forms an image in a record medium, With the head actuator which said recording head is driven [ actuator ] and makes an ink droplet breathe out, and the horizontal-scanning actuator which drives said recording head along a main scanning direction, and performs horizontal scanning With the Banking Inspection Department which detects the existence of the regurgitation of an ink droplet from the nozzle of said



recording head A cleaning means to apply negative pressure to the nozzle of said recording head, to make discharge ink, and to wipe away a nozzle forming face by the wiping member, In the regurgitation inspection approach of the ink droplet of the ink jet type recording device equipped with the control section for controlling said each part It is characterized by performing the regurgitation of ink and inspecting the existence of the expulsion of an ink droplet from a nozzle by the Banking Inspection Department after that by supplying the Flushing driving signal to a recording head, after termination of a cleaning means of operation.

[0013] As a result of detecting the existence of the expulsion of an ink droplet from the nozzle by said Banking Inspection Department here, when a non-actuation nozzle is accepted, it is desirable to apply negative pressure to the nozzle of said recording head, to make ink discharge with a cleaning means, to wipe away a nozzle forming face by the wiping member, to perform the regurgitation of ink by supplying the Flushing driving signal to a recording head, and to inspect the existence of the regurgitation of the ink droplet from the nozzle by the Banking Inspection Department after that.

[0014] Moreover, it is desirable after inspection termination of the existence of the expulsion of an ink droplet from the nozzle of the recording head by said Banking Inspection Department to perform the regurgitation of ink by supplying the Flushing driving signal to a recording head. Furthermore, when the count of inspection of the existence of the expulsion of an ink droplet from the nozzle of the recording head by said Banking Inspection Department is judged to count and count[ of predetermined ]-do, it is desirable to make an error message. This error message is made by the display means by the side of a recording device, or the display means by the side of a host computer.

[0015] Thus, after termination of a cleaning means of operation, by supplying the Flushing driving signal to a recording head, the regurgitation of ink is performed and, according to the ink jet type recording device concerning this invention, and the regurgitation inspection approach of an ink droplet, the existence of the expulsion of an ink droplet from a nozzle is inspected by the Banking Inspection Department after that. Therefore, since it shifts to the condition of shifting to the defect condition (non-actuation condition) which does not carry out the regurgitation of the ink thoroughly all over Flushing, or carrying out the regurgitation of the ink good again even if there is an unstable nozzle, the condition does not change after expulsion-of-an-ink-droplet inspection. Consequently, in expulsion-of-an-ink-droplet inspection, the existence of expulsion of an ink droplet can be detected certainly, and inconvenience does not arise by subsequent printing actuation.

[0016] moreover, as a result of inspecting the existence of the expulsion of an ink droplet

from the nozzle by the Banking Inspection Department, when a non-actuation nozzle is accepted Apply negative pressure to the nozzle of said recording head, and ink is made to discharge with a cleaning means. Since the nozzle forming face was wiped away by the wiping member, the regurgitation of ink was performed by supplying the Flushing driving signal to a recording head and the existence of the regurgitation of the ink droplet by the Banking Inspection Department is detected again, A nozzle can be recovered thoroughly and good printing can be performed.

[0017] In addition, thickening of ink may be prevented by performing the regurgitation of ink by supplying the Flushing driving signal to a recording head after detection termination of the existence of the expulsion of an ink droplet by the Banking Inspection Department. Moreover, an error message may be made in order to tell a user about a maintenance being required, when the count of inspection of the existence of the expulsion of an ink droplet by the Banking Inspection Department is judged to count and count[ of predetermined ]-do. This error message is made by the display means by the side of a recording device, or the display means by the side of a host computer.

[0018]

[Embodiment of the Invention] The operation gestalt of the ink jet type recording device concerning this invention is explained based on drawing. Drawing 1 R> 1 is the outline perspective view showing the main configurations of the ink jet type recording device 20 as 1 operation gestalt of this invention. This recording device 20 is equipped with the form stacker 22, the paper feed roller 24 driven with the step motor which is not illustrated, the platen plate 26, carriage 28, the step motor 30, the towage belt 32 driven with a step motor 30, and the guide rail 34 for carriage 28. The recording head 36 equipped with many nozzles is carried in carriage 28.

[0019] A print sheet P is rolled round with the paper feed roller 24 from the form stacker 22, and the front-face top of the platen plate 26 is sent in the direction of vertical scanning. Carriage 28 is led to the towage belt 32 driven with a step motor 30, and moves to a main scanning direction along with a guide rail 34. The main scanning direction is vertical to the direction of vertical scanning. In addition, although printing by the recording head 36 is performed to the print sheet P on the platen plate 26 in this horizontal scanning, the field on the platen plate 26 with which this printing is performed is called a "printing field."

[0020] Drawing 2 is the explanatory view showing the configuration of a recording device [ / near the inspecting region where regurgitation inspection (regurgitation inspection of an ink droplet may be hereafter called dot omission inspection) of an ink droplet is conducted ]. The dot omission Banking Inspection Department 40, the waste

ink receptacle 46, and the cleaning means 200 are formed in guide-rail 34 lower part of the outside (it sets to drawing 1 and is right-hand side) of a printing field. In addition, in drawing 1 and drawing 2, as for an example and other configurations, the cleaning means 200 is omitting only the head cap 210 and the wiping member 211. This dot omission Banking Inspection Department 40, the waste ink receptacle 46, and the field in which the head cap 210 is formed are called a "coordination area" to the above "a printing field" among the courses which a recording head 36 moves to a main scanning direction along with a guide rail 34.

[0021] The dot omission Banking Inspection Department 40 has light-emitting part 40a and light sensing portion 40b, and inspects a dot omission by investigating the flight condition of an ink droplet using these light-emitting part 40a and light sensing portion 40b. About the detailed content of inspection by the dot omission Banking Inspection Department 40, it mentions later.

[0022] The waste ink receptacle 46 is a container which receives the ink droplet breathed out from a nozzle in the case of dot omission inspection. The pars basilaris ossis occipitalis of this waste ink receptacle 46 is covered with the felt for the splashproof of an ink droplet. Moreover, although "Flushing" which sets a predetermined time interval and carries out the regurgitation of the ink droplet from a nozzle about the nozzle of a recording head 36 for prevention of the poor regurgitation by thickening of ink is performed, this Flushing is also performed on the waste ink receptacle 46. And the waste ink receptacle 46 also receives the ink droplet breathed out in that case. In addition, since regurgitation inspection of an ink droplet is conducted in the field on this waste ink receptacle 46, the field on this waste ink receptacle 46 is called an "inspecting region" among the successive ranges of the main scanning direction of a recording head 36.

[0023] The head cap 210 is a cap with confidentiality, when not printing, is put on a recording head 36 and prevents desiccation of the ink in a nozzle. Moreover, also when a nozzle is got blocked, the head cap 210 is put on a recording head 36, and cleaning treatment mentioned later is performed. In addition, since nozzle cleaning is performed in the field on this head cap 210, the field on this head cap 210 is called a "cleaning field" among the successive ranges of the main scanning direction of a recording head 36.

[0024] Drawing 3 is the block diagram showing the electric configuration of a recording apparatus 20. The recording apparatus 20 is equipped with the consultation buffer memory 50 which consults the signal supplied from the host computer 100, image BUFFA 52 which stores print data, the system controller 54 which controls actuation of the recording apparatus 20 whole, main memory 56, and a timer 58. The

horizontal-scanning actuation driver 61 which drives the carriage motor 30, the vertical-scanning actuation driver 62 which drives the paper feed motor 31, the Banking Inspection Department driver 63 which drives the dot omission Banking Inspection Department 40, and the head actuation driver 66 which drives a recording head 36 are connected to the system controller 54.

[0025] The printer driver (not shown) of a host computer 100 determines various kinds of parameter value which specifies printing actuation based on the print modes (a high-speed print mode, high-definition print mode, etc.) which the user specified. This printer driver generates the print data for printing by that print mode further based on such parameter value, and transmits them to a recording device 20. The transmitted print data are once stored in the receiving buffer memory 50. Within a recording apparatus 20, a system controller 54 reads required information in the receiving buffer memory 50 out of print data, and sends a control signal to each driver based on this.

[0026] The print data of two or more color components obtained by disassembling the print data received by the receiving buffer memory 50 for every color component are stored in the image buffer 52. The head actuation driver 66 drives the nozzle array of each color in which the print data of each color component were prepared by the recording head 36 according to read-out and this from the image buffer 52 according to the control signal from a system controller 54.

[0027] Next, the outline of the Flushing actuation is explained. Among the nozzles prepared in the recording head, while not being used about a nozzle with low operating frequency, the volatile constituent falls out from the ink in a nozzle, the viscosity of ink increases little by little (thickening), and the phenomenon in which the flying speed of the ink droplet breathed out becomes small occurs. With the nozzle which is not used too much for a long period of time, thickening of ink may progress and a nozzle may carry out blinding. Although it does not result in blinding, if the flying speed of the ink droplet which carries out the regurgitation becomes small with some nozzles, consequently dispersion in the flying speed of the ink droplet for every nozzle becomes large, printing image quality will be spoiled. That is, since a head carries out the regurgitation of the ink droplet, being displaced relatively to print media, if dispersion arises in a flying speed, dispersion will arise in the location (an impact location, i.e., the location in which an ink dot is formed) where an ink droplet reaches on print media, and it will cause aggravation of printing image quality.

[0028] In order to avoid aggravation of the image quality by thickening of such ink, actuation called Flushing (\*\*\*\*\*) is performed in a recording device 20. This is actuation which breathes out an ink droplet compulsorily from all nozzles, and

discharges thickening ink. If periodical Flushing is performed and thickening of ink is prevented, aggravation of the image quality by thickening of ink is avoidable. Moreover, the ink droplet which carries out the regurgitation from a nozzle after the cleaning actuation described later may be unstable. Thus, it can be made to shift to the condition of either the stable state which performs the good regurgitation of ink, or the non-actuation condition which does not carry out the regurgitation of the ink by performing Flushing about an unstable nozzle.

[0029] Since the operating frequency of a nozzle changes with printing image quality, setting out of a print speed, etc. which it is going to obtain not to mention being dependent on the image which it is going to print intricately, it is difficult frequency to predict with which nozzle thickening occurs about what time beforehand. For this reason, Flushing carries out periodical blowdown of an ink droplet about all nozzles. Like discharging of the usual ink droplet, from a nozzle, an ink droplet is breathed out by the head actuation driver 66, and this Flushing is performed. Therefore, especially the device for Flushing is not necessarily established. However, in order to receive the ink droplet which carries out the regurgitation, the waste ink receptacle 46 is formed. That is, Flushing is an inspecting region ( drawing 2 ) and is performed in the condition that a recording head 36 is located on the waste ink receptacle 46.

[0030] Next, the outline is explained about cleaning treatment. Drawing 4 is the conceptual diagram showing the configuration of the cleaning means 200. The cleaning means 200 is equipped with the head cap 210, the wiping member 211, the hose 220, and the pump roller 230. This cleaning means 200 is formed in the opposite hand of a platen plate on both sides of the waste ink receptacle 46 of drawing 1 . In addition, in drawing 1 , the graphic display is omitted about the configuration of the head cap 210 and cleaning means 200 other than wiping member 211.

[0031] The rubber frame 214 is formed in the top face of the box 212 of the head cap 210. If a recording head 36 moves to the cleaning field ( drawing 2 ) of a main scanning direction at the time of cleaning in cleaning, the wiping member 211 will advance on the migration locus of a recording head 36, the nozzle forming face of a recording head will be wiped away, and the paper powder and the dust adhering to a nozzle forming face will be removed. Then, the head cap 210 goes up and the rubber frame 214 sticks to the underside of a recording head 36. Consequently, a closed space is formed with the underside of a recording head 36, and the head cap 210.

[0032] The pump roller 230 has two small rollers 232,234 near the periphery section. The hose 220 is wound around the perimeter of these two small rollers 232,234. If it drives on the paper feed motor 31 ( drawing 2 ) and the pump roller 230 rotates in the

direction of arrow-head A, the air in a hose 220 will be pushed with the small roller 232,234, and a closed space in the head cap 210 will be exhausted by this. Consequently, ink is attracted from each nozzle of a recording head 36, and it is discharged by the waste ink blowdown section which is not illustrated through a hose 220. Moreover, blowdown of the ink which exists at the head of a nozzle supplies new ink to a nozzle from an ink cartridge side.

[0033] Next, regurgitation inspection (dot omission inspection) of an ink droplet is explained. Drawing 5 is the explanatory view showing the configuration and the principle of the inspection approach of the dot omission Banking Inspection Department 40. Drawing 5 R> 5 is drawing which looked at the recording head 36 from the underside side, and light-emitting part 40a and light sensing portion 40b which constitute the nozzle array of six classification by color of a recording head 36 and the 1st dot omission Banking Inspection Department 40 are drawn. black ink nozzle group KD for carrying out the regurgitation of the black ink to the underside of a recording head 36 dark cyanogen ink nozzle group CD for carrying out the regurgitation of the dark cyanogen ink light cyanogen ink nozzle group CL for carrying out the regurgitation of the light cyanogen ink Dark Magenta ink nozzle group MD for carrying out the regurgitation of the dark Magenta ink Light Magenta ink nozzle group ML for carrying out the regurgitation of the light Magenta ink Yellow ink nozzle group YD for carrying out the regurgitation of the yellow ink It is formed. In addition, the capital letter of the first alphabet in the sign which shows each nozzle group means the ink color, and it means, respectively that "L" of a suffix is ink with comparatively low concentration about "D" of a suffix being ink with comparatively high concentration.

[0034] Two or more nozzles of each nozzle group have aligned along the direction SS of vertical scanning, respectively. At the time of printing, an ink droplet is breathed out from each nozzle, a recording head 36 moving to a main scanning direction MS with carriage 28 ( drawing 1 ). Light-emitting part 40a is laser with which an outer diameter injects the flux of light L about 1mm or less. As shown in drawing 5 , this laser beam L is injected in the direction which inclined in the direction SS of vertical scanning a little, and is received by light sensing portion 40b.

[0035] Next, the principle of dot omission inspection is explained. Drawing 6 is the enlarged drawing showing the principle of the inspection approach of dot omission inspection. In the case of dot omission inspection, first, a recording head 36 is moved with constant speed as shown by the arrow head AR of drawing 5 , and it is the dark yellow YD. Laser beam L is approached sequentially from the nozzle group. It is the dark yellow YD as, as for laser beam L, a recording head 36 is sent like drawing 6 R> 6

at this time. The lower part of each nozzle will be crossed in order of nozzle #48, #47, #46, and , from the back end of a nozzle group (relatively). In addition, the nozzle group of 1 classification by color of a recording head 36 assumes that it is what has 48 nozzle #1-#48, respectively here.

[0036] And laser beam L is the dark yellow YD. If nozzle #1 located in the front end of a nozzle group is crossed, it is the light Magenta ink nozzle group ML next. The lower part of each nozzle is crossed in order of nozzle #48, #47, #46, and , from the back end of a nozzle group. the same -- carrying out -- drawing 5 -- setting -- an arrow head a1, a2, and a3 etc. -- it is shown -- as -- black ink nozzle group KD Every (relatively) one lower part of each nozzle will be crossed until it results in nozzle #1 of the front end. When laser beam L crosses right under, before and after including timing to which an ink droplet crosses laser beam L, regurgitation directions of fixed time amount and an ink droplet are issued by each nozzle. That is, when ink droplet locus space and the ink droplet detection space of a laser beam cross, the regurgitation directions of an ink droplet also including that order are issued so that an ink droplet may pass through both share space.

[0037] Here, the "ink droplet detection space" of laser beam L is space which has the beam reinforcement of extent which can detect an ink droplet among the optical paths of laser beam L. In addition, on these descriptions, since it is easy, "the ink droplet detection space of laser beam L" may only be written to be "laser beam L." Moreover, also in drawing, it is only written as "L." In addition, although the laser beam is used for light in the 1st example, when using light other than a laser beam, "ink droplet detection space" can be appointed at the space whose luminous intensity is beyond a predetermined value among the optical paths of the light which a light-emitting part emits. Moreover, "ink droplet locus space" means "the locus assumed to breathe out from a nozzle the ink droplet which has predetermined magnitude, and to pass through space." An ink droplet may protrude this "ink droplet locus space" from this ink droplet locus space from it being a thing based on anticipation actually. In such a case, even if ink droplet (based on anticipation) locus space and the ink droplet detection space of laser beam L cross, an ink droplet may not fully interrupt the light of the Banking Inspection Department. However, if an ink droplet is breathed out within limits which the lower part assumed normally from the nozzle, the breathed-out ink droplet will interrupt the ink droplet detection space of laser beam L on the way.

[0038] If an ink droplet is breathed out within limits which the lower part assumed normally from the nozzle, since the breathed-out ink droplet interrupts the ink droplet detection space of laser beam L on the way, the quantity of light which light-receiving in

light sensing portion 40b is interrupted temporarily, or becomes weak and is received will become under a predetermined threshold. In this case, it can be judged that there is no blinding in that nozzle. On the other hand, when the quantity of light received by light sensing portion 40b within the actuation period of a certain nozzle is beyond a predetermined threshold, it is judged that blinding of the nozzle may be carried out. Therefore, the "ink droplet detection space" of laser beam L is space with the intensity of light only per [ which can detect lowering of the quantity of light by it by light sensing portion 40b ] unit area, when the ink droplet which is an object for detection among the optical paths of laser beam L is in the space and interrupts a self light for projected area. [0039] As it explained above, it is the black ink nozzle group KD. By the time nozzle #1 of the front end passes through the upper part of laser beam L, regurgitation inspection of an ink droplet will be made about all nozzles. In addition, it is desirable that it is made to carry out the regurgitation of it several drops at a time about one nozzle since it may be unable to detect sufficiently certainly whether laser beam L was intercepted in one drop of ink. In this detection method, since the existence (namely, existence of a dot omission) of the blinding of each nozzle is inspected by detecting the ink droplet under flight, there is an advantage that inspection is completed comparatively for a short time. [0040] In addition, about the direction of delivery of a recording head 36, the inspection same also as sending to which sense of a main scanning direction is realizable. And although a recording head 36 shall be led to the towage belt 32 driven with a step motor 30 and shall be sent to a main scanning direction along with a guide rail 34 on carriage 28 ( drawing 1 ), it is good here also as what is independently equipped with a checking head scan driving gear. Namely, the recording device should just be equipped with the delivery device in which both relative position is made to be changed, by moving at least one side of a nozzle and the Banking Inspection Department. Equipment can be miniaturized if the equipment which performs horizontal scanning of a head in printing, and the equipment which scans in inspection are made to serve a double purpose by the same device. It can have the optimal equipment which met the object of inspection, like the thing which, on the other hand, has independently equipment which scans in inspection, then the precision of a location are high.

[0041] Next, procedure is explained based on drawing 7 . A system controller 54 starts the processing which shows drawing 7 , when it has been recognized that the time amount beyond fixed time amount has passed since the specific event with the timer 58. That is, a recording head 36 is sent to the cleaning field of a coordination area from a printing field at step S1. And the above mentioned cleaning treatment is made. A recording head 36 is sent to an inspecting region from a cleaning field after the cleaning



treatment. And in the inspecting region on the waste ink receptacle 46 ( drawing 2 ), the regurgitation (Flushing) of an ink droplet is performed from each nozzle (step S2).

[0042] After the regurgitation of the ink of the specified quantity is completed, once moving a recording head 36 to a printing field, a recording head 36 is again sent to a coordination area from a printing field. And in the inspecting region on the waste ink receptacle 46 ( drawing 2 ), regurgitation inspection of the ink droplet of each nozzle is conducted at step S3 (step 3). In step S4, it judges whether the non-actuation nozzle (nozzle which does not carry out the regurgitation of the ink) was detected. When a non-actuation nozzle is detected, the count of regurgitation inspection is judged in step S5. And when the count of regurgitation inspection is not over the count of predetermined, in return and a cleaning field ( drawing 2 ), a nozzle is cleaned to step S1, and Flushing is performed (step 2). Then, regurgitation inspection of an ink droplet is conducted (step 3), and it judges whether the non-actuation nozzle was detected (step 4). And when a non-actuation nozzle is detected again, the count of inspection is judged and return and the above-mentioned actuation are again repeated to step S1. On the other hand, when said non-actuation nozzle is not detected in step 4, Flushing is performed (step 6) and processing is ended.

[0043] In addition, in step S5, the count of regurgitation inspection is judged, when it is over the count of predetermined, cleaning is not performed, but an error message is performed (step 7), and it warns of a maintenance being required for a user. The display means by the side of a recording device or the display means by the side of a host computer performs this error message. That is, even if cleaning, Flushing, and regurgitation inspection are conducted 5 times, when a non-actuation nozzle is detected, it warns of a maintenance being required for a user.

[0044] Thus, since it is constituted so that Flushing processing may be performed after cleaning treatment and regurgitation inspection may be conducted after that, the unstable nozzle by cleaning treatment can be made to shift to the nozzle of the condition of either a nozzle of operation or a non-actuation nozzle by Flushing. Consequently, in regurgitation inspection of an ink droplet, a non-actuation nozzle is certainly detectable.

[0045] Next, other procedure is explained based on drawing 8 . This procedure conducts 1st regurgitation inspection, without passing through cleaning treatment and the Flushing processing unlike the processing shown in drawing 7 . A system controller 54 starts the processing which shows drawing 8 , when it has been recognized that the time amount beyond fixed time amount has passed since the specific event with the timer 58. That is, a recording head 36 is sent to the inspecting region of a coordination area from a printing field. And in the inspecting region on the waste ink receptacle 46 ( drawing

2), regurgitation inspection of the ink droplet of each nozzle is conducted (step S10).

[0046] And it judges whether the non-actuation nozzle was detected as a result of regurgitation inspection of an ink droplet (step S11). When the count of regurgitation inspection is judged in step S12 when a non-actuation nozzle is detected, and it is not over the count of predetermined, in a cleaning field ( drawing 2 ), a nozzle is cleaned (step 13), Flushing is performed (step 14), after that, it returns to step 10 and inspection of an ink droplet is conducted again (step 10). On the other hand, in step 11, when a non-actuation nozzle is not detected, Flushing is performed (step 15) and it ends.

[0047] In addition, like the processing shown in drawing 7 , the count of regurgitation inspection is judged, when it is over the count of predetermined, cleaning is not performed, but an error message is performed in step S12, and it warns of a maintenance being required for a user (step 16). That is, even if regurgitation inspection, cleaning, and Flushing are performed 5 times, when a non-actuation nozzle is detected, it warns of a maintenance being required for a user. In addition, the display means by the side of a recording device or the display means by the side of a host computer performs an error message.

[0048] Thus, since it is constituted so that Flushing may be performed after cleaning treatment and regurgitation inspection may be conducted again when there is a non-actuation nozzle as a result of regurgitation inspection of an ink droplet, the unstable nozzle by cleaning treatment can be made to shift to the nozzle of the condition of either a nozzle of operation or a non-actuation nozzle by Flushing. Consequently, in regurgitation inspection, a non-actuation nozzle is certainly detectable.

[0049] In addition, through each driver, a system controller 54 ( drawing 2 ) controls the carriage motor 30, the dot omission Banking Inspection Department 40, and a recording head 36, and, specifically, realizes these processings. Moreover, although a system controller 54 performs those control according to the given program, the program is recorded on main memory 56. This program is stored in main memory 56 with this operation gestalt at the time of activation of the above-mentioned processing. However, it is good also as that by which a system controller 54 controls according to the program stored in the main memory of a host computer 100 ( drawing 2 ). Moreover, this program is the phase before being stored in memory at the time of activation, and can be stored in the hard disk of a host computer 100. Furthermore, this program is also recordable on the record medium of portability besides these record media by which fixed installation is carried out. That is, it is also recordable on record media, such as a flash memory, a floppy (trademark) disk, CD-R, M, and CD-RW. Moreover, it is also storable in the record medium connected to the network through direct or a computer. That is, as

long as it is the object which can record the program to which the above-mentioned control is made to carry out as a record medium of this program, what kind of thing may be used.

[0050]

[Effect of the Invention] Thus, since according to the ink jet type recording device concerning this invention, and the regurgitation inspection approach of an ink droplet Flushing was performed and the Banking Inspection Department has detected the existence of the expulsion of an ink droplet from a nozzle after that after cleaning actuation termination, even if there is an unstable nozzle, it can be made to shift to the condition which does not carry out the regurgitation of the ink thoroughly all over Flushing, or the condition of performing the good regurgitation. Consequently, after expulsion of an ink droplet inspection, the condition of a nozzle does not change and the existence of expulsion of an ink droplet can be certainly detected in expulsion of an ink droplet inspection.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. \*\*\*\* shows the word which can not be translated.

3. In the drawings, any words are not translated.

---

**DESCRIPTION OF DRAWINGS**

---

[Brief Description of the Drawings]

[Drawing 1] Drawing 1 is the outline perspective view having shown the whole body configuration of a recording device to which the operation gestalt of this invention was applied.

[Drawing 2] Drawing 2 is the explanatory view showing the physical relationship of a head cap with the platen plate formed in the recording device shown in drawing 1, the dot omission Banking Inspection Department, and a waste ink receptacle.

[Drawing 3] Drawing 3 is the block diagram showing the electric configuration of a recording apparatus.

[Drawing 4] Drawing 4 is the conceptual diagram showing the configuration of a cleaning means.

[Drawing 5] Drawing 5 is the explanatory view showing the principle of the dot omission Banking Inspection Department and its inspection approach.

[Drawing 6] Drawing 6 is the enlarged drawing showing the principle of the inspection approach of dot omission inspection.

[Drawing 7] Drawing 7 is flow chart drawing having shown procedure.

[Drawing 8] Drawing 8 is flow chart drawing having shown other procedure.

[Description of Notations]

20 Recording Device

22 Form Stacker

24 Paper Feed Roller

26 Platen Plate

28 Carriage

30 Carriage Motor

31 Paper Feed Motor

32 Towage Belt

34 Guide Rail  
36 Recording Head  
40 Dot Omission Banking Inspection Department  
46 Waste Ink Receptacle  
50 Consultation Buffer Memory  
52 Image Buffer  
54 System Controller  
56 Main Memory  
58 Timer  
61 Horizontal-Scanning Actuation Driver  
62 Vertical-Scanning Actuation Driver  
63 Banking Inspection Department Driver  
66 Head Actuation Driver  
100 Host Computer  
210 Head Cap  
211 Wiping Member

---

[Translation done.]